



Diesel/Medium-Heavy Truck Technology

Program of Studies
2014-2015



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Diesel/Medium Heavy Truck Technology Courses

Course Title	Post-Secondary Connection	Valid Course Code	Recommended Grade Level							Recommended Credit
			6	7	8	9	10	11	12	
Brakes (Diesel)	DIT 180	470422						X	X	.5
Brakes Lab (Diesel)	DIT 181	470440						X	X	.5
Climate Control (Diesel)	DIT 170	470438						X	X	.5
Climate Control Lab (Diesel)	DIT 171	470439						X	X	.5
Diesel Eng Repair	DIT 112	470423						X	X	.5
Diesel Eng Repair Lab	DIT 113	470431						X	X	.5
Electrical Systems For Diesel Equipment	DIT 190	470425						X	X	.5
Electrical Systems For Diesel Equipment Lab	DIT 191	470441						X	X	.5
Hydraulics (Diesel)	DIT 140	470426						X	X	.5
Hydraulics Lab (Diesel)	DIT 141	470434						X	X	.5
Intro To Diesel Engine	DIT 110	470421						X	X	.5
Intro To Diesel Engine Lab	DIT 111	470430						X	X	.5
Mechanical Concepts	DIT 100	470406					X	X	X	.5
Powertrain (Diesel)	DIT 150	470427						X	X	.5
Powertrain Lab (Diesel)	DIT 151	470435						X	X	.5
Prevent Maintenance Lab	DIT 103	470403						X	X	.5
Steering & Suspension (Diesel)	DIT 160	470424						X	X	.5
Steering And Suspension Lab (Diesel)	DIT 161	470437						X	X	.5
Co-Op I (Diesel)	DIT 199	470442						X	X	1
Co-Op Ii (Diesel)	DIT 299	470443						X	X	1
Co-Op Iii (Diesel)	DIT 199/299	470444						X	X	1
Industrial Safety	ISX 100	460301						X	X	.5
Personal Financial Mgmt	BAS 120	060170				X	X	X	X	.5
Internship I (Diesel)	DIT 198	470445						X	X	1
Internship Ii (Diesel)	DIT 298	470446						X	X	1
Internship Iii (Diesel)	DIT 198/DIT 298	470447						X	X	1
Precision Measurement	PMX 100	470546					X	X	X	.5
Special Problems I (Diesel)	DIT 193	470477						X	X	1
Special Problems Ii (Diesel)	DIT 195	470478						X	X	1
Special Problems Iii (Diesel)	DIT 197	470479						X	X	1
Workplace Principles	WPP 200	060191				X	X	X	X	.5
Basic Auto Electricity	ADX 120	470556					X	X	X	.5
Basic Auto Electricity Lab	ADX 121	470557					X	X	X	.5

DIESEL/MEDIUM-HEAVY TRUCK TECHNOLOGY EDUCATION

Overview of Diesel/Medium-Heavy Truck Technology Education

Purpose:

The vision of Diesel/Medium-Heavy Truck Technology Education is to promote safety standards and performance standards, enhance leadership, provide relevant curriculum, and to be vital to the education of all students.

Kentucky Transportation Education will:

- Operate as the center for nationally recognized industry standard training.
- Provide a critical link in school to employment or postsecondary education.
- Develop stronger relationships with the community in terms of mutual advocacy, cooperative field experiences, employment placement, and support for relevant student organizations and competitions
- Represent an important component in the education of all students.
- Require and promote critical thinking and problem solving.
- Offer an up to date curriculum based on standards that adapts to changes in the industry.
- Integrate academic skills into the Transportation Education Curriculum in order to insure that students develop written & verbal communications skills, computational skills, and scientific/math problem-solving skills.

Career Pathways:

*Diesel Brake Repairer

*Diesel Engine/Electrician Technician

*Diesel Front End Mechanic

Standard Based Curriculum

The curriculum is composed of industry standards based competencies/tasks. Therefore, the teaching/learning focus is on the final results rather than the process.

Kentucky Occupational Skill Standards

The Kentucky Occupational Skill Standards are the performance specifications that identify the knowledge, skills, and abilities an individual needs to succeed in the workplace. Identifying the necessary skills is critical to preparing students for entry into employment or postsecondary education. These standards described the necessary **occupational, academic, and employability** skills needed to enter the workforce or post-secondary education in specific career areas. There is an ongoing effort to continue to refine these standards by which exemplary Transportation Education Programs are evaluated and certified. This helps insure that curriculum meets industry specifications.

Work Based Learning

Cooperative experience, internships, shadowing and mentoring opportunities provide depth and breadth of learning in the instructional program and allow students to apply the concepts learned in the classroom. The Work Base Learning Guide is available on the KDE webpage: www.education.ky.gov.

Student Organizations and Competitions

Participation in Skills USA Competition provides a vehicle for students to employ higher order thinking skills, to interact with high-level industry people and to further enhance their leadership skill through their participation in regional, state and national competitive events and local activities.

DIESEL/MEDIUM-HEAVY TRUCK TECHNOLOGY

Career Pathway	Pathway Courses	Elective Courses
<p>Diesel Brake Repairer</p> <p>CIP Code: 47.0605.01</p> <p><u>Tests for Certification</u></p> <ul style="list-style-type: none"> * ASE Student Certification- Brakes (Diesel) Electrical/Electronic Systems (Diesel) * KOSSA-Transportation Test 	<ul style="list-style-type: none"> *Brakes *Brakes Lab *Basic Automotive Electricity *Basic Automotive Electricity Lab *Electrical Systems for Diesel Equipment *Electrical Systems for Diesel Equipment Lab *Mechanical Concepts *Preventive Maintenance 	No Electives.
<p>Diesel Engine/Electrician Technician</p> <p>CIP Code: 47.0605.02</p> <p><u>Tests for Certification</u></p> <ul style="list-style-type: none"> * ASE Student Certification- Diesel Engines Electrical/Electronic Systems (Diesel) * KOSSA-Transportation Test 	<ul style="list-style-type: none"> *Basic Automotive Electricity *Basic Automotive Electricity Lab *Electrical Systems for Diesel Equipment *Electrical Systems for Diesel Equipment Lab *Intro to Diesel Engines and Lab *Diesel Engines and Lab <p><i>NOTE: The Preventive Maintenance and Mechanical Concepts Courses must be completed before the student can begin the Diesel Engine/Electrician Pathway.</i></p>	No Electives.
<p>Diesel Front End Mechanic</p> <p>CIP Code: 47.0605.03</p> <p><u>Tests for Certification</u></p> <ul style="list-style-type: none"> * ASE Student Certification- Suspension and Steering (Diesel) Electrical/Electronic Systems (Diesel) * KOSSA-Transportation Test 	<ul style="list-style-type: none"> *Basic Automotive Electricity *Basic Automotive Electricity Lab *Electrical Systems for Diesel Equipment *Electrical Systems for Diesel Equipment Lab *Steering and Suspension (Diesel) *Steering and Suspension (Diesel) Lab *Mechanical Concepts *Preventive Maintenance 	No Electives.

Sample Career Pathway/Diesel-Medium Heavy Truck

KENTUCKY CAREER PATHWAY/PROGRAM OF STUDY TEMPLATE									
COLLEGE/UNIVERSITY:						CLUSTER:	Transportation		
HIGH SCHOOL (S):						PATHWAY:	Diesel Engine/Electrical Technician		
						PROGRAM:	Diesel/Medium-Heavy Truck Technology		
GRADE	ENGLISH	MATH	SCIENCE	SOCIAL STUDIES	REQUIRED COURSES RECOMMENDED ELECTIVE COURSES OTHER ELECTIVE COURSES CAREER AND TECHNICAL EDUCATION COURSES			CREDENTIAL CERTIFICATE DIPLOMA DEGREE	SAMPLE OCCUPATIONS
9	English I	Algebra I	Integrated Science	World Civ	Health / Phys Ed				
10	English II	Algebra II	Biology	Integ Social Studies	Life Skills				
11			Physical Science or Chem or Physics		DIT 110 Intro to Diesel Engines	DIT 111 Intro to Automotive Engines Lab	ADX 120-121 Basic Electricity and Mechanical Concepts	DIT 103 Preventive Maintenance DIT 100 Mechanical Concepts	
12	English III	Geometry	Physics	U.S. History					
	English IV		Computer Tech	Arts/Humanities	DIT 112 Diesel Engine Repair	DIT 113 Diesel Engine Repair Lab	DIT 190 Electrical Systems - Diesel	DIT 191 Electrical Systems Lab- Diesel	ASE Student Certification Entry Level Diesel/Electrical Technician
	Take Compass/ACT	Math Elective							
Year 13				Computer Applications	DIT 180 Brakes (Diesel)	DIT 181 Brakes Lab (Diesel)	DIT 160 Suspension and Steering Lab	DIT 161 Suspension and Steering Lab	
Year 14	Writing I	Math	Science		Powertrain (DIT 150/151)	Hydraulics (DIT 140/141)	Climate Control (ADX 170/171)	DIT 199 Co-Op (Diesel)	Diesel Repair Technician
Year 15			Humanities	Social Interaction					
Year 16									
POSTSECONDARY									
Required Courses									
Recommended Elective Courses									
Other Elective Courses									
Career and Technical Education Courses									
Credit-Based Transition Programs (e.g. Dual/Concurrent Enrollment, Articulated Courses, 2+2+2) (◆ =High School to Comm. College) (● =Com. College to 4-Yr Institution) (▲ = Opportunity to test out)									
Mandatory Assessments, Advising, and Additional Preparation									

Diesel/Medium-Heavy Truck Courses/Tasks

Preventive Maintenance Lab

Valid Course Code:

470403

Course Description

This course provides the student with instruction on preventive maintenance practices, scheduled procedures, documents, DOT-required record system, and determining the needs for repair. It is assumed that: 1. In all areas, appropriate theory, safety, and support instruction will be required in the performance of each task; 2. This instruction includes identification and use of the appropriate tools and testing and measurement equipment required to accomplish certain tasks; 3. The student has received the necessary training to locate and use current reference and training materials from accepted industry resources (paper and electronic formats).

Content/Process

Student Will:

1. Check engine starting/operation (including unusual noises, vibrations, exhaust smoke, etc.); record idle and governed rpm.
2. Inspect vibration damper.
3. Inspect belts, tensioners, and pulleys; check and adjust belt tension; check belt alignment.
4. Check engine oil level and condition; check dipstick seal.
5. Inspect engine mounts for looseness and deterioration.
6. Check engine for oil, coolant, air, fuel, and exhaust leaks (Engine Off and Running).
7. Check engine compartment wiring harnesses, connectors, and seals for damage and proper routing.
8. Check fuel tanks, mountings, lines, caps, and vents.
9. Drain water from fuel system.
10. Service water separator/fuel heater; replace fuel filter(s); prime and bleed fuel system.
11. Check exhaust system mountings for looseness and damage.
12. Check engine exhaust system for leaks, proper routing, and damaged or missing components to include exhaust gas recirculation (EGR) system and aftertreatment devices, if equipped.
13. Check air induction system: piping, charge air cooler, hoses, clamps, and mountings; check for air restrictions and leaks.
14. Inspect turbocharger for leaks; check mountings and connections.
15. Check operation of engine compression/exhaust brake.

16. Service or replace air filter as needed; check and reset air filter restriction indicator.
17. Check operation of fan clutch.
18. Inspect radiator (including air flow restriction, leaks, and damage) and mountings.
19. Inspect fan assembly and shroud.
20. Pressure test cooling system and radiator cap.
21. Inspect coolant hoses and clamps.
22. Inspect coolant recovery system.
23. Check coolant for contamination, additive package concentration, and protection level (freeze point).
24. Service coolant filter.
25. Inspect water pump for leaks and bearing play.
26. Change engine oil and filters; visually check oil for coolant or fuel contamination; inspect and clean magnetic drain plugs.
27. Take an engine oil sample.
28. Inspect key condition and operation of ignition switch.
29. Check warning indicators.
30. Check instruments; record oil pressure and system voltage.
31. Check operation of electronic power take off (PTO) and engine idle speed controls (if applicable).
32. Check HVAC controls.
33. Check operation of all accessories.
34. Using diagnostic tool or on-board diagnostic system; retrieve engine monitoring information; check and record diagnostic codes and trip/operational data (including engine, transmission, ABS, and other systems).
35. Check operation of electric/air horns and reverse warning devices.
36. Check condition of spare fuses, triangles, fire extinguisher, and all required decals.
37. Inspect seat belts and sleeper restraints.
38. Inspect wiper blades and arms.
39. Check operation of wiper and washer.
40. Inspect windshield glass for cracks or discoloration; check sun visor.
41. Check seat condition, operation, and mounting.
42. Check door glass and window operation.
43. Inspect steps and grab handles.

44. Inspect mirrors, mountings, brackets, and glass.
45. Record all observed physical damage.
46. Lubricate all cab and hood grease fittings.
47. Inspect and lubricate door and hood hinges, latches, strikers, lock cylinders, safety latches, linkages, and cables.
48. Inspect cab mountings, hinges, latches, linkages and ride height; service as needed.
49. Inspect A/C condenser and lines for condition and visible leaks; check mountings.
50. Inspect A/C compressor and lines for condition and visible leaks; check mountings.
51. Check A/C system condition and operation; check A/C monitoring system, if applicable.
52. Check HVAC air inlet filters and ducts; service as needed.
53. Inspect battery box(es), cover(s), and mountings.
54. Inspect battery hold-downs, connections, cables, and cable routing; service as needed.
55. Check/record battery state-of-charge (open circuit voltage) and condition.
56. Perform battery test (load and/or capacitance).
57. Inspect starter, mounting, and connections.
58. Engage starter; check for unusual noises, starter drag, and starting difficulty.
59. Inspect alternator, mountings, cable, wiring, and wiring routing; determine needed action.
60. Perform alternator output tests.
61. Check operation of interior lights; determine needed action.
62. Check all exterior lights, lenses, reflectors, and conspicuity tape; check headlight alignment; determine needed action.
63. Inspect and test tractor-to-trailer multi-wire connector(s), cable(s), and holder(s); determine needed action.
64. Check operation of parking brake.
65. Record air governor cut-out setting (psi).
66. Check operation of air reservoir/tank drain valve.
67. Check air system for leaks (brakes released).
68. Check air system for leaks (brakes applied).
69. Test one-way and double-check valves.
70. Check low air pressure warning devices.

71. Check air governor cut-in pressure.
72. Check emergency (spring) brake control/modulator valve, if applicable.
73. Check tractor protection valve.
74. Test air pressure build-up time.
75. Inspect coupling air lines, holders, and gladhands.
76. Check brake chambers and air lines for secure mounting and damage.
77. Check operation of air drier.
78. Inspect and record brake shoe/pad condition, thickness, and contamination
79. Inspect and record condition of brake drums/rotors.
80. Check antilock brake system wiring, connectors, seals, and harnesses for damage and proper routing.
81. Check operation and adjustment of brake automatic slack adjusters (ASA); check and record push rod stroke.
82. Lubricate all brake component grease fittings.
83. Check condition and operation of hand brake (trailer) control valve.
84. Perform antilock brake system (ABS) operational system self-test.
85. Drain air tanks and check for contamination.
86. Check condition of pressure relief (safety) valves.
87. Check master cylinder fluid level and condition.
88. Inspect brake lines, fittings, flexible hoses, and valves for leaks and damage.
89. Check parking brake operation; inspect parking brake application and holding devices; adjust as needed.
90. Check operation of hydraulic system: pedal travel, pedal effort, pedal feel (drift).
91. Inspect calipers for leakage and damage.
92. Inspect power brake assist system (booster), hoses and control valves; check brake assist reservoir fluid level and condition.
93. Inspect and record brake lining/pad condition, thickness, and contamination.
94. Inspect and record condition of brake rotors.
95. Check antilock brake system wiring, connectors, seals, and harnesses for damage and proper routing.
96. Check operation of clutch, clutch brake, and gearshift.
97. Check clutch linkage/cable for looseness or binding, if applicable
98. Check hydraulic clutch slave and master cylinders, lines, fittings, and hoses, if applicable.

99. Check clutch adjustment; adjust as needed.
100. Check transmission case, seals, filter, hoses, and cooler for cracks and leaks.
101. Inspect transmission breather.
102. Inspect transmission mounts.
103. Check transmission oil level, type, and condition.
104. Inspect U-joints, yokes, driveshafts, boots/seals, center bearings, and mounting hardware for looseness, damage, and proper phasing.
105. Inspect axle housing(s) for cracks and leaks.
106. Inspect axle breather(s).
107. Lubricate all drive train grease fittings.
108. Check drive axle(s) oil level, type, and condition.
109. Change drive axle(s) oil and filter; check and clean magnetic plugs.
110. Check transmission wiring, connectors, seals, and harnesses for damage and proper routing.
111. Change transmission oil and filter; check and clean magnetic plugs.
112. Check interaxle differential lock operation.
113. Check range shift operation.
114. Check steering wheel operation for free play or binding.
115. Check power steering pump, mounting, and hoses for leaks, condition, and routing; check fluid level.
116. Change power steering fluid and filter.
117. Inspect steering gear for leaks and secure mounting.
118. Inspect steering shaft U-joints, pinch bolts, splines, pitman arm-to-steering sector shaft, tie rod ends, and linkages.
119. Check kingpin for wear.
120. Check wheel bearings for looseness and noise.
121. Check oil level and condition in all non-drive hubs; check for leaks.
122. Inspect springs, pins, hangers, shackles, spring U-bolts, and insulators.
123. Inspect shock absorbers for leaks and secure mounting.
124. Inspect air suspension springs, mounts, hoses, valves, linkage, and fittings for leaks and damage.
125. Check and record suspension ride height.
126. Lubricate all suspension and steering grease fittings.

127. Check toe setting.
128. Check tandem axle alignment and spacing.
129. Check axle locating components (radius, torque, and/or track rods).
130. Inspect tires for wear patterns and proper mounting.
131. Inspect tires for cuts, cracks, bulges, and sidewall damage.
132. Inspect valve caps and stems; replace as needed.
133. Measure and record tread depth; probe for imbedded debris.
134. Check and record air pressure; adjust air pressure in accordance with manufacturers' specifications.
135. Check for loose lugs; check mounting hardware condition; service as needed.
136. Re-torque lugs in accordance with manufacturers' specifications.
137. Inspect wheels for cracks or damage.
138. Check tire matching (diameter and tread) on dual tire installations.
139. Inspect fifth wheel mounting, bolts, air lines, and locks.
140. Test operation of fifth wheel locking device; adjust if necessary.
141. Check quarter fenders, mud flaps, and brackets.
142. Check pintle hook assembly and mounting.
143. Lubricate all fifth wheel grease fittings and plate.
144. Inspect frame and frame members for cracks and damage.

Connections:

Common Core State Standards

*KOSSA

*Common Core Technical Standards

*New Generation Science Standards

*Post-Secondary: KCTCS DIT 103

*CTSO's – Skills USA

Introduction to Diesel Engines

Valid Course Codes:

Class: 470421

Lab: 470430

Course Description

This course introduces the fundamental concepts of the operation of two- and four-stroke diesel and gasoline engines. Topics included are basic engine components and their functions, engine performance terminology, two- and four-stroke operation, combustion principles, and engine disassembly with basic hand tools. It is assumed that: 1. In all areas, appropriate theory, safety, and support instruction will be required in the performance of each task; 2. This instruction includes identification and use of the appropriate tools and testing and measurement equipment required to accomplish certain tasks; 3. The student has received the necessary training to locate and use current reference and training materials from accepted industry resources (paper and electronic formats).

Content/Process

Students Will:

1. Inspect fuel, oil, and coolant levels and condition; determine needed action.
2. Identify causes of engine fuel, oil, coolant, air, and other leaks; determine needed action.
3. Listen for engine noises; determine needed action.
4. Observe engine exhaust smoke color and quantity; determine needed action.
5. Identify causes of no cranking, cranks but fails to start, hard starting, and starts but does not continue to run problems; determine needed action.
6. Identify causes of surging, rough operation, misfiring, low power, slow deceleration, slow acceleration, and shutdown problems; determine needed action.
7. Identify engine vibration problems; determine needed action.
8. Check and record electronic diagnostic codes and trip/operational data; monitor electronic data; verify customer programmable parameters; clear codes; determine further diagnosis.
9. Remove, clean, inspect for visible damage, and replace cylinder head(s) assembly.
10. Clean and inspect threaded holes, studs, and bolts for serviceability; determine needed action.
11. Inspect cylinder head for cracks/damage; check mating surfaces for warpage; check condition of passages; inspect core/expansion and gallery plugs; determine needed action.
12. Disassemble head and inspect valves, guides, seats, springs, retainer, rotators, locks, and seals; determine needed action.
13. Measure valve head height relative to deck and valve face-to-seat contact; determine needed action.
14. Inspect injector sleeves and seals; replace; measure injector tip or nozzle protrusion; determine needed action.

15. Inspect valve train components; determine needed action.
16. Reassemble cylinder head.
17. Inspect, measure, and replace/reinstall overhead camshaft; measure/adjust end play and backlash.
18. Inspect cam followers; determine needed action.
19. Adjust valve bridges (crossheads); adjust valve clearances and injector settings.
20. Perform crankcase pressure test; determine needed action.
21. Remove, inspect, service, and install pans, covers, gaskets, seals, wear rings, and crankcase ventilation components.
22. Disassemble, clean, and inspect engine block for cracks/damage; measure mating surfaces for warpage; check condition of passages, core/expansion and gallery plugs; inspect threaded holes, studs, dowel pins, and bolts for serviceability; determine needed action.
23. Inspect cylinder sleeve counterbore and lower bore; check bore distortion; determine needed action.
24. Clean, inspect, and measure cylinder walls or liners for wear and damage; determine needed action.
25. Replace/reinstall cylinder liners and seals; check and adjust liner height (protrusion).
26. Inspect in-block camshaft bearings for wear and damage; determine needed action.
27. Inspect, measure, and replace/reinstall in-block camshaft; measure/adjust end play.
28. Clean and inspect crankshaft for surface cracks and journal damage; check condition of oil passage(s); check passage plugs; measure journal diameter; determine needed action.
29. Inspect main bearings for wear patterns and damage; replace as needed; check bearing clearances; check and correct crankshaft end play.
30. Inspect, install, and time gear train; measure gear backlash; determine needed action.
31. Inspect connecting rod and bearings for wear patterns; measure pistons, pins, retainers, and bushings; perform needed action.
32. Determine piston-to-cylinder wall clearance; check ring-to-groove fit and end gap; install rings on pistons.
33. Assemble pistons and connecting rods; install in block; install rod bearings and check clearances.
34. Inspect and measure crankshaft vibration damper; determine needed action.
35. Inspect, install, and align flywheel housing; inspect flywheel housing(s) to transmission housing/engine mating surface(s) and measure flywheel housing face and bore runout; determine needed action.

36. Inspect flywheel/flexplate (including ring gear) and mounting surfaces for cracks and wear; measure runout; determine needed action.
37. Test engine oil pressure and check operation of pressure sensor, gauge, and/or sending unit; test engine oil temperature and check operation of temperature sensor; determine needed action.
38. Check engine oil level, condition, and consumption; determine needed action.
39. Inspect and measure oil pump, drives, inlet pipes, and pick-up screens; check drive gear clearances; determine needed action.
40. Inspect oil pressure regulator valve(s), by-pass and pressure relief valve(s), oil thermostat, and filters; determine needed action.
41. Inspect, clean, and test oil cooler and components; determine needed action.
42. Inspect turbocharger lubrication and cooling systems; determine needed action.
43. Determine proper lubricant and perform oil and filter change.
44. Check engine coolant type, level, condition, and consumption; test coolant for freeze protection and additive package concentration; determine needed action.
45. Test coolant temperature and check operation of temperature sensor, gauge, and/or sending unit; determine needed action.
46. Inspect and reinstall/replace pulleys, tensioners and drive belts; adjust drive belts and check alignment.
47. Inspect thermostat(s), by-passes, housing(s), and seals; replace as needed.
48. Recover, flush, and refill with recommended coolant/additive package; bleed cooling system.
49. Inspect coolant conditioner/filter assembly for leaks; inspect valves, lines, and fittings; replace as needed.
50. Inspect water pump and hoses; replace as needed.
51. Inspect, clean, and pressure test radiator, pressure cap, tank(s), and recovery systems; determine needed action.
52. Inspect thermostatic cooling fan system (hydraulic, pneumatic, and electronic) and fan shroud; replace as needed.

Connections:

Common Core State Standards

*KOSSA

*Common Core Technical Standards

*New Generation Science Standards

*Post-Secondary: KCTCS DIT 110-111

*CTSO's – Skills USA

Diesel Engine Repair

Valid Course Codes

Class: 470423

Lab: 470431

Course Description

Students learn to take a disassembled engine and evaluate the condition of each component. They identify the use or function of each component of the engine. Topics include cylinder block and components, cylinder heads and valve train components, and engine lubrication systems. It is assumed that: 1. In all areas, appropriate theory, safety, and support instruction will be required in the performance of each task; 2. This instruction includes identification and use of the appropriate tools and testing and measurement equipment required to accomplish certain tasks; 3. The student has received the necessary training to locate and use current reference and training materials from accepted industry resources (paper and electronic formats).

Content/Process

Students Will:

1. Perform air intake system restriction and leakage tests; determine needed action.
2. Perform intake manifold pressure (boost) test; determine needed action.
3. Perform exhaust back pressure test; determine needed action.
4. Inspect turbocharger(s), wastegate, and piping systems; determine needed action.
5. Inspect and test turbocharger(s) (variable ratio/geometry VGT), pneumatic, hydraulic, electronic controls, and actuators.
6. Check air induction system: piping, hoses, clamps, and mounting;; service or replace air filter as needed.
7. Remove and reinstall turbocharger/wastegate assembly.
8. Inspect intake manifold, gaskets, and connections; replace as needed.
9. Inspect, clean, and test charge air cooler assemblies; inspect aftercooler assemblies; replace as needed.
10. Inspect exhaust manifold, piping, mufflers, and mounting hardware; repair or replace as needed.
11. Inspect exhaust after treatment devices; determine necessary action.
12. Inspect and test preheater/inlet air heater, or glow plug system and controls; perform needed action.
13. Inspect and test exhaust gas recirculation (EGR) system including EGR valve, cooler, piping, filter, electronic sensors, controls, and wiring; determine needed action.
14. Check fuel level, and condition; determine needed action.
15. Perform fuel supply and return system tests; determine needed action.
16. Inspect fuel tanks, vents, caps, mounts, valves, screens, crossover system, supply and return lines and fittings; determine needed action.

17. Inspect, clean, and test fuel transfer (lift) pump, pump drives, screens, fuel/water separators/indicators, filters, heaters, coolers, ECM cooling plates, and mounting hardware; determine needed action.
18. Inspect and test low pressure regulator systems (check valves, pressure regulator valves, and restrictive fittings); determine needed action.
19. Check fuel system for air; determine needed action; prime and bleed fuel system; check primer pump.
20. Perform on-engine inspections, tests, and adjustments; check and adjust timing or replace and time a distributor (rotary) type injection pump; determine needed action.
21. Perform on-engine inspections, tests, and adjustments; check and adjust timing or replace and time an in-line type injection pump; determine needed action.
22. Inspect and adjust throttle control linkage; determine needed action.
23. Inspect air/fuel ratio control systems; determine needed action.
24. Inspect, test, and adjust engine fuel shut-down devices and controls; determine needed action.
25. Inspect high pressure injection lines, hold downs, fittings and seals; replace as needed.
26. Inspect and test power and ground circuits and connections; measure and interpret voltage, voltage drop, amperage, and resistance readings using a digital multimeter (DMM); determine needed action.
27. Interface with vehicle's on-board computer; perform diagnostic procedures using recommended electronic diagnostic equipment and tools (to include PC based software and/or data scan tools); determine needed action.
28. Check and record electronic diagnostic codes and trip/operational data; monitor electronic data; clear codes; determine further diagnosis.
29. Locate and use relevant service information (to include diagnostic procedures, flow charts, and wiring diagrams).
30. Inspect and replace electrical connector terminals, seals, and locks.
31. Inspect and test switches, sensors, controls, actuator components, and circuits; adjust or replace as needed.
32. Using recommended electronic diagnostic tools (to include PC based software and/or data scan tools), access and interpret customer programmable parameters.
33. Inspect, test, and adjust electronic unit injectors (EUI); determine needed action.
34. Remove and install electronic unit injectors (EUI) and related components; recalibrate ECM (if applicable).
35. Perform cylinder contribution test utilizing recommended electronic diagnostic tool.

36. Perform on-engine inspections and tests on hydraulic electronic unit injectors and system electronic controls; determine needed action.
37. Perform on-engine inspections and tests on hydraulic electronic unit injector high pressure oil supply and control systems; determine needed action.
38. Perform on-engine inspections and tests on common rail type injection systems; determine needed action.
39. Inspect high pressure injection lines, hold downs, fittings and seals; determine needed action.
40. Inspect and adjust engine compression/exhaust brakes; determine needed action.
41. Inspect and adjust engine compression/exhaust brakes; determine needed action.
42. Inspect, test, and adjust engine compression/exhaust brake control circuits, switches, and solenoids; repair or replace as needed.
43. Inspect engine compression/exhaust brake housing, valves, seals, lines, and fittings; repair or replace as needed.

Connections:

Common Core State Standards

*KOSSA

*Common Core Technical Standards

*New Generation Science Standards

*Post-Secondary: KCTCS DIT 112-113

*CTSO's – Skills USA

Hydraulics
Valid Course Codes:
Class: 470426
Lab: 470434

Course Description

This course introduces the theory and operation of a complete hydraulic system including all components. Components include: fluids, piping, reservoirs, actuators, directional valves, servo valves, pressure control valves, pumps, complete hydraulic circuits and accessories. It is assumed that: 1. In all areas, appropriate theory, safety, and support instruction will be required in the performance of each task; 2. This instruction includes identification and use of the appropriate tools and testing and measurement equipment required to accomplish certain tasks; 3. The student has received the necessary training to locate and use current reference and training materials from accepted industry resources (paper and electronic formats).

Content/Process

Students Will:

1. Identify system type (closed and open) and verify proper operation
2. Read and interpret system diagrams and schematics.
3. Perform system temperature, pressure, flow, and cycle time tests; determine needed action.
4. Verify placement of equipment/component safety labels and placards; determine needed action.
5. Identify system fluid type.
6. Identify causes of pump failure, unusual pump noises, temperature, flow, and leakage problems; determine needed action.
7. Determine pump type, rotation, and drive system.
8. Remove and install pump; prime and/or bleed system.
9. Inspect pump inlet for restrictions and leaks; determine needed action.
10. Inspect pump outlet for restrictions and leaks; determine needed action.
11. Identify type of filtration system; verify filter application and flow direction.
12. Service filters and breathers.
13. Identify causes of system contamination; determine needed action.
14. Take a hydraulic oil sample.
15. Check reservoir fluid level and condition; determine needed action.
16. Inspect and repair or replace reservoir, sight glass, vents, caps, mounts, valves, screens, supply and return lines.
17. Diagnose causes of component leakage, damage, and restriction; determine needed action.

18. Inspect hoses and connections (length, size, routing, bend radii, and protection); repair or replace as needed.
19. Assemble hoses, tubes, connectors, and fittings in accordance with manufacturers' specifications; use proper procedures to avoid contamination.
20. Inspect and replace fitting seals and sealants.
21. Pressure test system safety relief valve; determine needed action.
22. Perform control valve operating pressure and flow tests; determine needed action.
23. Inspect, test, and adjust valve controls (electrical/electronic, mechanical, and pneumatic).
24. Identify causes of control valve leakage problems (internal/external); determine needed action.
25. Inspect pilot control valve linkages, cables, and PTO controls; adjust, repair, or replace as needed.
26. Identify actuator type (single/double acting, multi-stage/telescopic, and motors)..
27. Identify the cause of seal failure; determine needed repairs.
28. Identify the cause of incorrect actuator movement and leakage (internal and external); determine needed repairs.
29. Inspect actuator mounting, frame components, and hardware for looseness, cracks, and damage; determine needed action.
30. Remove, repair, and/or replace actuators in accordance with manufacturers' recommended procedures.
31. Inspect actuators for dents, cracks, damage, and leakage; determine needed action.
32. Purge and/or bleed system in accordance with manufacturers' recommended procedures.

Connections:

Common Core State Standards

*KOSSA

*Common Core Technical Standards

*New Generation Science Standards

*Post-Secondary: KCTCS DIT 140-141

*CTSO's – Skills USA

Powertrain (Diesel)
Valid Course Codes:
Class: 470427
Lab: 470435

Course Description

This course emphasizes the theory and principles of the power train systems. Students learn to diagnose and repair components, such as: clutches, drive lines, propeller shafts, differentials, and final drives. It is assumed that: 1. In all areas, appropriate theory, safety, and support instruction will be required in the performance of each task; 2. This instruction includes identification and use of the appropriate tools and testing and measurement equipment required to accomplish certain tasks; 3. The student has received the necessary training to locate and use current reference and training materials from accepted industry resources (paper and electronic formats).

Content/Process

Students Will:

1. Identify causes of clutch noise, binding, slippage, pulsation, vibration, grabbing, dragging, and chatter problems; determine needed action.
2. Inspect and adjust clutch linkage, cables, levers, brackets, bushings, pivots, springs, and clutch safety switch (includes push and pull-type assemblies); check pedal height and travel; perform needed action.
3. Inspect, adjust, repair, or replace hydraulic clutch slave and master cylinders, lines, and hoses; bleed system.
4. Inspect, adjust, lubricate, or replace release (throw-out) bearing, sleeve, bushings, springs, housing, levers, release fork, fork pads, rollers, shafts, and seals.
5. Inspect, adjust, and replace single-disc clutch pressure plate and clutch disc.
6. Inspect, adjust, and replace two-plate clutch pressure plate, clutch discs, intermediate plate, and drive pins/lugs.
7. Inspect and/or replace clutch brake assembly; inspect input shaft and bearing retainer; perform needed action.
8. Inspect, adjust, and replace self-adjusting/continuous-adjusting clutch mechanisms.
9. Inspect and replace pilot bearing.
10. Inspect flywheel mounting area on crankshaft, rear main oil seal, and measure crankshaft end play; determine needed action.
11. Inspect flywheel, starter ring gear and measure flywheel face and pilot bore runout; determine needed action.
12. Inspect flywheel housing(s) to transmission housing/engine mating surface(s) and measure flywheel housing face and bore runout; determine needed action.
13. Identify causes of transmission noise, shifting, lockup, jumping-out-of-gear, overheating, and vibration problems; determine needed action.
14. Inspect, test, repair, or replace air shift controls, lines, hoses, valves, regulators, filters, and cylinder assemblies.

15. Inspect and replace transmission mounts, insulators, and mounting bolts.
16. Inspect for leakage and replace transmission cover plates, gaskets, seals, and cap bolts; inspect seal surfaces and vents; repair as needed.
17. Check transmission fluid level and condition; determine needed service; add proper type of lubricant.
18. Inspect, adjust, and replace transmission shift lever, cover, rails, forks, levers, bushings, sleeves, detents, interlocks, springs, and lock bolts/safety wires.
19. Remove and reinstall transmission.
20. Inspect input shaft, gear, spacers, bearings, retainers, and slingers; determine needed action.
21. Inspect transmission oil filters and coolers; replace as needed.
22. Inspect speedometer components; determine needed action.
23. Inspect and adjust power take-off (P.T.O.) assemblies, controls, and shafts; determine needed action.
24. Inspect and test function of reverse light, neutral start, and warning device circuits; determine needed action.
25. Inspect and test transmission temperature gauge and sensor/sending unit; determine needed action.
26. Inspect and test operation of automated mechanical transmission and manual electronic shift controls, shift, range and splitter solenoids, shift motors, indicators, speed and range sensors, electronic/transmission control units (ECU/TCU), neutral/in gear and reverse switches, and wiring harnesses; determine needed action.
27. Inspect and test operation of automated mechanical transmission electronic shift selectors, air and electrical switches, displays and indicators, wiring harnesses, and air lines; determine needed action.
28. Use appropriate diagnostic tools and procedures to diagnose automated mechanical transmission problems; check and record diagnostic codes, clear codes, and interpret digital multimeter (DMM) readings; determine needed action.
29. Inspect and test operation of automatic transmission electronic shift controls, shift solenoids, shift motors, indicators, speed and range sensors, electronic/transmission control units (ECU/TCU), neutral/in gear and reverse switches, and wiring harnesses.
30. Inspect and test operation of automatic transmission electronic shift selectors, switches, displays and indicators, wiring harnesses.
31. Use appropriate diagnostic tools and procedures to diagnose automatic transmission problems; check and record diagnostic codes, clear codes, and interpret digital multimeter (DMM) readings; determine needed action.
32. Identify causes of driveshaft and universal joint noise and vibration problems; determine needed action.

33. Inspect, service, or replace driveshaft, slip joints, yokes, drive flanges, and universal joints, driveshaft boots and seals, and retaining hardware; check phasing of all shafts.
34. Inspect driveshaft center support bearings and mounts; determine needed action.
35. Measure driveline angles; determine needed action.
36. Identify causes of drive axle(s) drive unit noise and overheating problems; determine needed action.
37. Check and repair fluid leaks; inspect and replace drive axle housing cover plates, gaskets, sealants, vents, magnetic plugs, and seals.
38. Check drive axle fluid level and condition; determine needed service; add proper type of lubricant.
39. Remove and replace differential carrier assembly.
40. Inspect and replace differential case assembly including spider gears, cross shaft, side gears, thrust washers, case halves, and bearings.
41. Inspect and replace components of locking differential case assembly.
42. Inspect differential carrier housing and caps, side bearing bores, and pilot (spigot, pocket) bearing bore; determine needed action.
43. Measure ring gear runout; determine needed action.
44. Inspect and replace ring and drive pinion gears, spacers, sleeves, bearing cages, and bearings.
45. Measure and adjust drive pinion bearing preload.
46. Measure and adjust drive pinion depth.
47. Measure and adjust side bearing preload and ring gear backlash.
48. Check and interpret ring gear and pinion tooth contact pattern; determine needed action.
49. Inspect, adjust, or replace ring gear thrust block/screw.
50. Inspect power divider (inter-axle differential) assembly; determine needed action.
51. Inspect, adjust, repair, or replace air operated power divider (inter-axle differential) lockout assembly including diaphragms, seals, springs, yokes, pins, lines, hoses, fittings, and controls.
52. Inspect, repair, or replace drive axle lubrication system: pump, troughs, collectors, slingers, tubes, and filters.
53. Inspect and replace drive axle shafts
54. Remove and replace wheel assembly; check rear wheel seal and axle flange gasket for leaks; perform needed action.

55. Identify causes of drive axle wheel bearing noise and check for damage; perform needed action.
56. Inspect and test drive axle temperature gauge and sending unit/sensor; determine needed action.
57. Clean, inspect, lubricate and replace wheel bearings; replace seals and wear rings; inspect and replace retaining hardware; adjust drive axle wheel bearings.
58. Diagnose transmission component failure cause, both before and during disassembly procedures; determine needed action
59. Inspect, adjust, service, repair, or replace transmission remote shift linkages, brackets, bushings, pivots, and levers.
60. Inspect and adjust main shaft, gears, sliding clutches, washers, spacers, bushings, bearings, auxiliary drive assemblies, retainers, and keys; replace as needed
61. Inspect countershafts, gears, bearings, retainers, and keys; adjust bearing preload and time multiple countershaft gears; replace as needed.
62. Inspect output shafts, gears, washers, spacers, bearings, retainers, and keys; replace as needed.
63. Inspect and/or replace reverse idler shafts, gears, bushings, bearings, thrust washers, and retainers; check reverse idler gear end play (where applicable); replace as needed.
64. Inspect synchronizer hub, sleeve, keys (inserts), springs, blocking rings, synchronizer plates, blocker pins, and sliding clutches; replace as needed.
65. Inspect transmission cases including surfaces, bores, bushings, pins, studs, and magnets; replace as needed.
66. Inspect transmission lubrication system pumps, troughs, collectors, and slingers; service or replace as needed.

Connections:

Common Core State Standards

*KOSSA

*Common Core Technical Standards

*New Generation Science Standards

*Post-Secondary: KCTCS DIT 150-151

*CTSO's – Skills USA

Steering and Suspension (Diesel)

Valid Course Codes:

Class: 470424

Lab: 470437

Course Description

The theory and operation of steering and suspension systems are presented including manual steering, power steering, springs and supports, steering linkage and alignment. It is assumed that: 1. In all areas, appropriate theory, safety, and support instruction will be required in the performance of each task; 2. This instruction includes identification and use of the appropriate tools and testing and measurement equipment required to accomplish certain tasks; 3. The student has received the necessary training to locate and use current reference and training materials from accepted industry resources (paper and electronic formats).

Content/Process

Students Will:

1. Identify causes of fixed and driver adjustable steering column and shaft noise, looseness, and binding problems; determine needed action.
2. Inspect and service steering shaft U-joint(s), slip joints, bearings, bushings, and seals; phase shaft..
3. Check and adjust cab mounting and ride height.
4. Center the steering wheel as needed.
5. Disable and enable supplemental restraint system (SRS) in accordance with manufacturers' procedures.
6. Identify causes of power steering system noise, steering binding, darting/oversteer, reduced wheel cut, steering wheel kick, pulling, non-recovery, turning effort, looseness, hard steering, overheating, fluid leakage, and fluid aeration problems; determine needed action.
7. Determine recommended type of power steering fluid; check level and condition; determine needed action.
8. Flush and refill power steering system; purge air from system.
9. Perform power steering system pressure, temperature, and flow tests; determine needed action.
10. Inspect, service, or replace power steering reservoir including filter, seals, and gaskets.
11. Inspect power steering pump drive gear and coupling; replace as needed.
12. Inspect, adjust, or replace power steering pump, mountings, and brackets.
13. Inspect and replace power steering system cooler, lines, hoses, clamps/mountings, hose routings, and fittings.
14. Inspect, adjust, repair, or replace integral type power steering gear(s) (single and/or dual) and mountings.
15. Inspect and align pitman arm; replace as needed.

16. Check and adjust steering (wheel) stops.
17. Inspect and lubricate steering arms and linkages.
18. Inspect front axles and attaching hardware; determine needed action.
19. Inspect and service kingpin, steering knuckle bushings, locks, bearings, seals, and covers; determine needed action.
20. Inspect shock absorbers, bushings, brackets, and mounts; replace as needed.
21. Inspect leaf springs, center bolts, clips, pins and bushings, shackles, slippers, insulators, brackets, and mounts; determine needed action.
22. Inspect axle aligning devices such as radius rods, track bars, stabilizer bars, torque arms, related bushings, mounts, shims, and cams; determine needed action.
23. Inspect tandem suspension equalizer components; determine needed action.
24. Inspect and test air suspension pressure regulator and height control valves, lines, hoses, dump valves, and fittings; adjust, repair or replace as needed
25. Inspect air springs, mounting plates, springs, suspension arms, and bushings; replace as needed.
26. Measure ride height; determine needed action.
27. Identify rough ride problems; determine needed action.
28. Identify causes of vehicle wandering, pulling, shimmy, hard steering, and off-center steering wheel problems; adjust or repair as needed.
29. Check camber; determine needed action.
30. Check caster; adjust as needed.
31. Check toe; adjust as needed.
32. Check rear axle(s) alignment (thrustline/centerline) and tracking; adjust or repair as needed.
33. Identify turning/Ackerman angle (toe-out-on-turns) problems; determine needed action.
34. Check front axle alignment (centerline); adjust or repair as needed.
35. Identify tire wear patterns, check tread depth and pressure; determine needed action.
36. Identify wheel/tire vibration, shimmy, pounding, hop (tramp) problems; determine needed action.
37. Remove and install steering and drive axle wheel/tire assemblies.
38. Inspect tire for proper application, (size, load range, position, and tread design); determine needed action.
39. Inspect wheel/rims for proper application, load range, size, and design; determine needed action.

40. Check operation of tire pressure monitoring system; determine needed action.
41. Inspect, service, and/or adjust fifth wheel, pivot pins, bushings, locking mechanisms, and mounting hardware.
42. Inspect and service sliding fifth wheel, tracks, stops, locking systems, air cylinders, springs, lines, hoses, and controls.
43. Inspect frame and frame members for cracks, breaks, corrosion, distortion, elongated holes, looseness, and damage; determine needed repairs.
44. Inspect, install, or repair frame hangers, brackets, and cross members in accordance with manufacturers' recommended procedures.
45. Inspect, repair, or replace pintle hooks and draw bars.
46. Inspect and reinstall/replace pulleys, tensioners, and drive belts; adjust drive belts and check alignment.
47. Adjust manual and automatic steering gear poppet/relief valves.
48. Inspect drag link (relay rod) and tie rod ends (ball and adjustable socket type); adjust or replace as needed.
49. Inspect steering arm and levers, and linkage pivot joints; replace as needed.
50. Inspect clamps and retainers on cross tube/relay rod/centerlink/tie rod; position or replace as needed.
51. Inspect torque arms, bushings, and mounts; determine needed action.

Connections:

Common Core State Standards

*KOSSA

*Common Core Technical Standards

*New Generation Science Standards

*Post-Secondary: KCTCS DIT 160-161

*CTSO's – Skills USA

Climate Control (Diesel)
Valid Course Codes:
Class: 470438 Lab: 470439

Course Description

This course introduces the theory and operation of heating and air conditioning systems. Air conditioning terminology and how to service and troubleshoot mechanical and electrical circuits of heating and air conditioning systems as emphasized. It is assumed that: 1. In all areas, appropriate theory, safety, and support instruction will be required in the performance of each task 2. This instruction includes identification and use of the appropriate tools and testing and measurement equipment required to accomplish certain tasks; 3. The student has received the necessary training to locate and use current reference and training materials from accepted industry resources

Content/Process

Students Will:

1. Verify the need for service or repair of HVAC systems based on unusual operating noises; determine needed action.
2. Verify the need for service or repair of HVAC systems based on unusual visual, smell, and touch conditions; determine needed action.
3. Identify system type and components (cycling clutch orifice tube – CCOT, expansion valve) and conduct performance test(s) on HVAC systems; determine needed action.
4. Retrieve diagnostic codes; determine needed action.
5. Identify causes of temperature control problems in the A/C system; determine needed action.
6. Identify refrigerant and lubricant types; check for contamination; determine needed action.
7. Identify A/C system problems indicated by pressure gauge and temperature readings; determine needed action.
8. Identify A/C system problems indicated by visual, audible, smell, and touch procedures; determine needed action.
9. Perform A/C system leak test; determine needed action.
10. Recover, evacuate, and recharge A/C system using appropriate equipment.
11. Identify contaminated A/C system components and hoses; determine needed action.
12. Identify A/C system problems that cause protection devices (pressure, thermal, and electronic) to interrupt system operation; determine needed action.
13. Inspect, test, and replace A/C system pressure, thermal, and electronic protection devices.
14. Inspect and replace A/C compressor drive belts, pulleys, and tensioners; adjust belt tension and check alignment.
15. Inspect, test, service, or replace A/C compressor clutch components or assembly.

16. Inspect and correct A/C compressor lubricant level (if applicable).
17. Inspect, test, or replace A/C compressor.
18. Inspect, repair, or replace A/C compressor mountings and hardware.
19. Correct system lubricant level when replacing the evaporator, condenser, receiver/drier or accumulator/drier, and hoses.
20. Inspect A/C system hoses, lines, filters, fittings, and seals; determine needed action.
21. Inspect A/C condenser for proper air flow.
22. Inspect and test A/C system condenser and mountings; determine needed action.
23. Inspect and replace receiver/drier or accumulator/drier.
24. Inspect and test cab/sleeper refrigerant solenoid, expansion valve(s); check placement of thermal bulb (capillary tube); determine needed action.
25. Remove and replace orifice tube.
26. Inspect and test secondary unit evaporator core; determine needed action.
27. Inspect, clean, or repair evaporator housing and water drain; inspect and service/replace evaporator air filter.
28. Identify and inspect A/C system service ports (gauge connections); determine needed action.
29. Identify the cause of system failures resulting in refrigerant loss from the A/C system high pressure relief device; determine needed action.
30. Identify causes of outlet air temperature control problems in the HVAC system; determine needed action.
31. Identify window fogging problems; determine needed action.
32. Perform engine cooling system tests for leaks, protection level, contamination, coolant level, coolant type, temperature, and conditioner concentration; determine needed action.
33. Inspect engine cooling and heating system hoses, lines, and clamps; determine needed action.
34. Inspect and test radiator, pressure cap, and coolant recovery system (surge tank); determine needed action.
35. Inspect water pump for leaks and bearing play; determine needed action.
36. Inspect and test thermostats, by-passes, housings, and seals; determine needed repairs.
37. Recover, flush, and refill with recommended coolant/additive package; bleed cooling system.
38. Inspect thermostatic cooling fan system (hydraulic, pneumatic, and electronic) and fan shroud; replace as needed.

39. Inspect and test heating system coolant control valve(s) and manual shut-off valves; determine needed action.
40. Inspect and flush heater core; determine needed action.
41. Identify causes of HVAC electrical control system problems; determine needed action.
42. Inspect and test HVAC blower motors, resistors, switches, relays, modules, wiring, and protection devices; determine needed action.
43. Inspect and test A/C compressor clutch relays, modules, wiring, sensors, switches, diodes, and protection devices; determine needed action.
44. Inspect and test A/C related electronic engine control systems; determine needed action.
45. Inspect and test engine cooling/condenser fan motors, relays, modules, switches, sensors, wiring, and protection devices; determine needed action.
46. Inspect and test electric actuator motors, relays/modules, switches, sensors, wiring, and protection devices; determine needed action.
47. Inspect and test HVAC system electrical/electronic control panel assemblies; determine needed action.
48. Identify causes of HVAC air, and mechanical control problems; determine needed action.
49. Inspect and test HVAC system air and mechanical control panel assemblies; determine needed action.
50. Inspect, test, and adjust HVAC system air and mechanical control cables and linkages; determine needed action.
51. Inspect and test HVAC system actuators and hoses; determine needed action.
52. Inspect, test, and adjust HVAC system ducts, doors, and outlets; determine needed action.
53. Maintain and verify correct operation of certified equipment.
54. Identify and recover A/C system refrigerant.
55. Recycle or properly dispose of refrigerant.
56. Handle, label, and store refrigerant.
57. Test recycled refrigerant for non-condensable gases.

Connections:

Common Core State Standards

*KOSSA

*Common Core Technical Standards

*New Generation Science Standards

*Post-Secondary: KCTCS DIT 170-171

*CTSO's – Skills USA

Brakes (Diesel)
Valid Course Codes:
Class: 470422
Lab: 470440

Course Description

This course introduces the theory and operation of air and hydraulic braking systems. This will include components such as: air and hydraulic actuators, air brake chambers, disc drums, linings, and brake adjustments. It is assumed that: 1. In all areas, appropriate theory, safety, and support instruction will be required in the performance of each task; 2. This instruction includes identification and use of the appropriate tools and testing and measurement equipment required to accomplish certain tasks; 3. The student has received the necessary training to locate and use current reference and training materials from accepted industry resources (paper and electronic formats).

Content/Process

Students Will:

1. Identify poor stopping, air leaks, premature wear, pulling, grabbing, dragging, or balance problems caused by supply and service system malfunctions; determine needed action.
2. Check air system build-up time; determine needed action.
3. Drain air reservoir/tanks; check for oil, water, and foreign material; determine needed action.
4. Inspect compressor drive gear and coupling; replace as needed.
5. Inspect air compressor inlet;; inspect oil supply and coolant lines, fittings, and mounting brackets; repair or replace as needed.
6. Inspect and test air system pressure controls: governor, unloader assembly valves, filters, lines, hoses, and fittings; adjust or replace as needed.
7. Inspect air system lines, hoses, fittings, and couplings; repair or replace as needed.
8. Inspect and test air tank relief (safety) valves, one-way (single) check valves, two-way (double) check valves, manual and automatic drain valves; replace as needed.
9. Inspect and clean air drier systems, filters, valves, heaters, wiring, and connectors; repair or replace as needed.
10. Inspect and test brake application (foot) valve, fittings, and mounts; check pedal operation; replace as needed.
11. Inspect and test stop light circuit switches, wiring, and connectors; repair or replace as needed.
12. Inspect and test hand brake (trailer) control valve, lines, fittings, and mountings; repair or replace as needed.
13. Inspect and test brake relay valves; replace as needed.
14. Inspect and test quick release valves; replace as needed.
15. Inspect and test tractor protection valve; replace as needed.

16. Inspect and test emergency (spring) brake control/modulator valve(s); replace as needed.
17. Inspect and test low pressure warning devices, wiring, and connectors; repair or replace as needed.
18. Inspect and test air pressure gauges, lines, and fittings; replace as needed.
19. Identify poor stopping, brake noise, premature wear, pulling, grabbing, or dragging problems caused by the foundation brake, slack adjuster, and brake chamber problems; determine needed action.
20. Inspect and test service brake chambers, diaphragm, clamp, spring, pushrod, clevis, and mounting brackets; repair or replace as needed
21. Inspect and service slack adjusters; perform needed action.
22. Inspect camshafts, rollers, bushings, seals, spacers, retainers, brake spiders, shields, anchor pins, and springs; replace as needed.
23. Inspect, clean, and adjust air disc brake caliper assemblies; determine needed repairs.
24. Inspect and measure brake shoes or pads; perform needed action.
25. Inspect and measure brake drums or rotors; perform needed action.
26. Inspect and test parking (spring) brake chamber diaphragm and seals; replace parking (spring) brake chamber; dispose of removed chambers in accordance with local regulations.
27. Inspect and test parking (spring) brake check valves, lines, hoses, and fittings; replace as needed.
28. Inspect and test parking (spring) brake application and release valve; replace as needed.
29. Manually release (cage) and reset (uncage) parking (spring) brakes in accordance with manufacturers' recommendations.
30. Identify poor stopping, premature wear, pulling, dragging, balance, or pedal feel problems caused by the hydraulic system; determine needed action.
31. Check brake pedal pushrod length; adjust as needed.
32. Inspect and test master cylinder for internal/external leaks and damage; replace as needed.
33. Inspect hydraulic system brake lines, flexible hoses, and fittings for leaks and damage; replace as needed.
34. Inspect and test metering (hold-off), load sensing/proportioning, proportioning, and combination valves; replace as needed.
35. Inspect and test brake pressure differential valve and warning light circuit switch, bulbs, wiring, and connectors; repair or replace as needed.
36. Inspect disc brake caliper assemblies; replace as needed.

37. Inspect/test brake fluid; bleed and/or flush system; determine proper fluid type.
38. Identify poor stopping, brake noise, premature wear, pulling, grabbing, dragging, or pedal feel problems caused by mechanical components; determine needed action.
39. Inspect and measure rotors; perform needed action.
40. Inspect and measure disc brake pads; inspect mounting hardware; perform needed action.
41. Check parking brake operation; inspect parking brake application and holding devices; adjust and replace as needed.
42. Identify stopping problems caused by the brake assist (booster) system; determine needed action.
43. Inspect, test, repair, or replace hydraulic brake assist (booster), hoses, and control valves; determine proper fluid type.
44. Check emergency (back-up, reserve) brake assist system.
45. Observe antilock brake system (ABS) warning light operation (includes dash mounted trailer ABS warning light); determine needed action.
46. Diagnose antilock brake system (ABS) electronic control(s) and components using self-diagnosis and/or specified test equipment (scan tool, PC computer); determine needed action.
47. Identify poor stopping and wheel lock-up problems caused by failure of the antilock brake system (ABS); determine needed action.
48. Test and check operation of antilock brake system (ABS) air, hydraulic, electrical, and mechanical components; perform needed action.
49. Test antilock brake system (ABS) wheel speed sensors and circuits ; adjust or replace as needed.
50. Bleed the ABS hydraulic circuits following manufacturers' procedures.
51. Observe automatic traction control (ATC) warning light operation; determine needed action.
52. Diagnose automatic traction control (ATC) electronic control(s) and components using self-diagnosis and/or specified test equipment (scan tool, PC computer); determine needed action.
53. Clean, inspect, lubricate and replace wheel bearings and races/cups; replace seals and wear rings; inspect spindle/tube; inspect and replace retaining hardware; adjust wheel bearings.
54. Inspect or replace extended service wheel bearing assemblies.

Connections:

Common Core State Standards

*KOSSA

*Common Core Technical Standards

*New Generation Science Standards

*Post-Secondary: KCTCS DIT 180-181

*CTSO's – Skills USA

Electrical Systems for Diesel Equipment

Valid Course Codes:

Class: 470425

Lab: 470441

Course Description

This course introduces the theory and operation of wiring circuits and battery service. This includes electrical safety, testing equipment, wiring, relays, switches, accessories, batteries, and lighting. Students learn the theory and operation of starting systems, charging systems, and motorized circuits. It is assumed that: 1. In all areas, appropriate theory, safety, and support instruction will be required in the performance of each task 2. This instruction includes identification and use of the appropriate tools and testing and measurement equipment required to accomplish certain tasks; 3. The student has received the necessary training to locate and use current reference and training materials from accepted industry resources (paper and electronic formats).

Content/Process

Students Will:

1. Read and interpret electrical/electronic circuits using wiring diagrams.
2. Check continuity in electrical/electronic circuits using appropriate test equipment.
3. Check applied voltages, circuit voltages, and voltage drops in electrical/electronic circuits using appropriate test equipment.
4. Check current flow in electrical/electronic circuits and components using appropriate test equipment.
5. Check resistance in electrical/electronic circuits and components using appropriate test equipment.
6. Locate shorts, grounds, and opens in electrical/electronic circuits.
7. Identify parasitic (key-off) battery drain problems; perform tests; determine needed action.
8. Inspect and test fusible links, circuit breakers, relays, solenoids, and fuses; replace as needed.
9. Inspect and test spike suppression devices; replace as needed.
10. Check frequency and pulse width signal in electrical/electronic circuits using appropriate test equipment.
11. Perform battery load test; determine needed action.
12. Determine battery state of charge using an open circuit voltage test.
13. Inspect, clean, and service battery; replace as needed.
14. Inspect and clean battery boxes, mounts, and hold-downs; repair or replace as needed.
15. Charge battery using slow or fast charge method as appropriate.
16. Inspect, test, and clean battery cables and connectors; repair or replace as needed.

17. Jump start a vehicle using jumper cables and a booster battery or appropriate auxiliary power supply using proper safety procedures.
18. Perform battery capacitance test; determine needed action.
19. Perform starter circuit cranking voltage and voltage drop tests; determine needed action
20. Inspect, test, and replace components and wires in the starter control circuit (key switch, push button and/or magnetic switch.)
21. Inspect, test, and replace starter relays and solenoids/switches.
22. Remove and replace starter; inspect flywheel ring gear or flex plate.
23. Test instrument panel mounted volt meters and/or indicator lamps; determine needed action.
24. Identify causes of a no charge, low charge, or overcharge problems; determine needed action.
25. Inspect, adjust, and replace alternator drive belts, pulleys, fans, tensioners, and mounting brackets
26. Perform charging system voltage and amperage output tests; perform AC ripple test; determine needed action.
27. Perform charging circuit voltage drop tests; determine needed action
28. Remove and replace alternator
29. Inspect, repair, or replace cables, wires, and connectors in the charging circuit.
30. Interface with vehicle's on-board computer; perform diagnostic procedures using recommended electronic diagnostic equipment and tools (including PC based software and/or data scan tools); determine needed action.
31. Identify causes of brighter than normal, intermittent, dim, or no headlight and daytime running light (DRL) operation.
32. Test, aim, and replace headlights.
33. Test headlight and dimmer circuit switches, relays, wires, terminals, connectors, sockets, and control components/modules; repair or replace as needed.
34. Inspect and test switches, bulbs/LEDs, sockets, connectors, terminals, relays, wires, and control components/modules of parking, clearance, and taillight circuits; repair or replace as needed.
35. Inspect and test instrument panel light circuit switches, relays, bulbs/LEDs, sockets, connectors, terminals, wires, and printed circuits/control modules; repair or replace as needed.
36. Inspect and test interior cab light circuit switches, bulbs, sockets, connectors, terminals, wires, and control components/modules; repair or replace as needed.

37. Inspect and test tractor-to-trailer multi-wire connector(s); repair or replace as needed.
38. Inspect, test, and adjust stoplight circuit switches, bulbs/LEDs, sockets, connectors, terminals, wires and control components/modules; repair or replace as needed.
39. Inspect and test turn signal and hazard circuit flasher(s), switches, relays, bulbs/LEDs, sockets, connectors, terminals, wires and control components/modules; repair or replace as needed.
40. Inspect and test reverse lights and warning device circuit switches, bulbs/LEDs, sockets, horns, buzzers, connectors, terminals, wires and control components/modules; repair or replace as needed.
41. Identify causes of intermittent, high, low, or no gauge readings; determine needed action.
42. Identify causes of data bus-driven gauge malfunctions; determine needed action.
43. Inspect and test gauge circuit sensor/sending units, gauges, connectors, terminals, and wires; repair or replace as needed.
44. Inspect and test warning devices (lights and audible) circuit sensor/sending units, bulbs/LEDs, sockets, connectors, wires, and control components/modules; repair or replace as needed.
45. Inspect, test, replace, and calibrate (if applicable) electronic speedometer, odometer, and tachometer systems.
46. Identify causes of constant, intermittent, or no horn operation; determine needed action.
47. Inspect and test horn circuit relays, horns, switches, connectors, wires, and control components/modules; repair or replace as needed.
48. Identify causes of constant, intermittent, or no wiper operation; diagnose the cause of wiper speed control and/or park problems; determine needed action.
49. Inspect and test wiper motor, resistors, park switch, relays, switches, connectors, wires and control components/modules; repair or replace as needed.
50. Inspect wiper motor transmission linkage, arms, and blades; adjust or replace as needed.
51. Inspect and test windshield washer motor or pump/relay assembly, switches, connectors, terminals, wires, and control components/modules; repair or replace as needed.
52. Inspect and test sideview mirror motors, heater circuit grids, relays, switches, connectors, terminals, wires and control components/modules; repair or replace as needed.
53. Inspect and test heater and A/C electrical components including: A/C clutches, motors, resistors, relays, switches, connectors, terminals, wires, and control components/modules; repair or replace as needed.

54. Inspect and test auxiliary power outlet, integral fuse, connectors, terminals, wires, and control components/modules; repair or replace as needed.
55. Identify causes of slow, intermittent, or no power side window operation; determine needed action.
56. Inspect and test motors, switches, relays, connectors, terminals, wires, and control components/modules of power side window circuits; repair or replace as needed.
57. Inspect and test block heaters; determine needed repairs.
58. Inspect and test cruise control electrical components; repair or replace as needed.
59. Inspect and test switches, relays, controllers, actuator/solenoids, connectors, terminals, and wires of electric door lock circuits.
60. Check operation of keyless and remote lock/unlock devices; determine needed action.
61. Inspect and test engine cooling fan electrical control components/modules; repair or replace as needed.
62. Identify causes of data bus communication problems; determine needed action.
63. Measure ohms with an ohmmeter, Measure voltage with a voltmeter, and Measure amps with an ammeter.
64. Draw and interpret electrical symbols, Construct series circuits, Construct parallel circuits, and Construct series-parallel circuits.
65. Diagnose AC voltage leakage (failed rectifier) at alternator output; determine needed action.

Connections:

Common Core State Standards

*KOSSA

*Common Core Technical Standards

*New Generation Science Standards

*Post-Secondary: KCTCS DIT 190-191

*CTSO's – Skills USA

Special Problems I, II, III, (Diesel)

Valid Course Codes:

470477/470478/470479

Course Description

Courses designed to enhance a student's understanding of shop situations and problems that arise when dealing with live work. It expands on the task lists that have already been taught in previous Diesel Courses. The instructor will teach students how to deal with real world problems that arise when repairing Medium/Heavy Truck vehicles subjected to various types of customer road use.

Content/Process

Student Will:

1. Diagnose and repair selected tasks/problems as determined by the instructor.

Connections:

Common Core State Standards

*KOSSA

*Common Core Technical Standards

*New Generation Science Standards

*Post-Secondary: KCTCS DIT 193-195-197

*CTSO's – Skills USA

Mechanical Concepts
Valid Course Code:
470406

Course Description	
This course introduces the student to the basic fundamentals of precision measurement and its application to the industrial setting.	
Content/Process	
<p>Students Will:</p> <ol style="list-style-type: none">1. Measure with a metric rule.2. Read an English vernier caliper and height gauge scale.3. Read a metric vernier caliper and height gauge scale.4. Read an English micrometer.5. Read a metric micrometer.6. Identify and use hole and plug gauges to check hole diameters.7. Identify and use thread gauges to check thread dimensions.8. Read and use various dial indicators.9. Identify and install fasteners.10. Identify, use, and maintain hand tools.11. Identify and use taps and dies.12. Identify and use proper rigging methods.13. Identify and use flaring tools.14. Identify and use a torque wrench.	
Connections:	
<p>Common Core State Standards *KOSSA *Common Core Technical Standards *New Generation Science Standards *Post-Secondary: KCTCS DIT 100 *CTSO's – Skills USA</p>	

Precision Measurement
Valid Course Code:
470546

Course Description

This class introduces the student to the basic fundamentals of precision measurement and its application in the industrial setting.

Content/Process

Students Will:

1. Measure with an English fraction rule.
2. Measure with an English decimal rule.
3. Measure with a metric steel rule.
4. Read an English vernier caliper and height gauge scale.
5. Read a metric vernier caliper and height gauge scale.
6. Read an English micrometer.
7. Read a metric micrometer.
8. Assemble English gauge blocks to specified measurements.
9. Assemble metric gauge blocks to specified measurements.
10. Use hole and plug gauges to check hole diameters.
11. Use thread gages to check thread dimensions.
12. Read and use various dial indicators.
13. Identify pneumatic, electrical, electronic, and optical comparators.

Connections:

Common Core State Standards

*KOSSA

*Common Core Technical Standards

*New Generation Science Standards

*ASE Student Certification

*ASE Professional Certification

*Post-Secondary: KCTCS PMX 100

CTSO's – Skills USA

Basic Automotive Electricity

Valid Course Codes:

Class: 470556

Lab: 470557

Course Description

This course introduces the student to the principles, theories, and concepts of the automotive electrical system that include the unique diagramming, coding and locating of wiring, and component devices. It is assumed that: 1. in all areas, appropriate theory, safety, and support instruction will be required for performing each task, including proper care and cleaning of customers vehicles. 2. The instruction has included identification and use of appropriate tools and testing and measurement equipment required to accomplish certain tasks; 3. The student has received the necessary training to locate and use current reference and training materials from accepted industry publications and resources; 4. In all areas, the student has demonstrated the ability to write work orders and warranty reports, to include information regarding problem resolution and the results of the work performed for the customer and manufacturer. The writing process will incorporate the "Three C's" (concern, cause and correction) as a format to communicate this information

Content/Processes

Students Will:

1. Complete work order to include customer information, vehicle identifying information, customer concern, related service history, cause, and correction.
2. Identify and interpret electrical/electronic system concern; determine necessary action.
3. Research applicable vehicle and service information, such as electrical/electronic system operation, vehicle service history, service precautions, and technical service bulletins.
4. Locate and interpret vehicle and major component identification numbers.
5. Diagnose electrical/electronic integrity of series, parallel and series-parallel circuits using principles of electricity (Ohm's Law).
6. Use wiring diagrams during diagnosis of electrical circuit problems.
7. Demonstrate the proper use of a digital multimeter (DMM) during diagnosis of electrical circuit problems, including: source voltage, voltage drop, current flow, and resistance.
8. Check electrical circuits with a test light; determine necessary action.
9. Check electrical circuits using fused jumper wires; determine necessary action.
10. Locate shorts, grounds, opens, and resistance problems in electrical/electronic circuits; determine necessary action.
11. Measure and diagnose the cause(s) of excessive parasitic draw; determine necessary action.
12. Inspect and test fusible links, circuit breakers, and fuses; determine necessary action.

13. Inspect and test switches, connectors, relays, solenoid solid state devices, and wires of electrical/electronic circuits; perform necessary action. 14. Remove and replace terminal end from connector; replace connectors and terminal ends. 15. Repair wiring harness (including CAN/BUS systems). 16. Perform solder repair of electrical wiring. 17. Identify location of hybrid vehicle high voltage circuit disconnect (service plug) location and safety procedures.	
<p style="text-align: center;">Connections:</p> *Common Core State Standards *KOSSA *Common Core Technical Standards *New Generation Science Standards *Post-Secondary: KCTCS ADX 120-121 CTSO's – Skills USA/Ford AAA	
<p style="text-align: center;">Recommended Texts/E-Learning</p> Today's Class	

Cooperative Education
Valid Course Codes:
470442/470443/470444

Course Description

Cooperative Education provides supervised on-the-job work experience related to the students' educational objectives. Students participating in the Cooperative Education program receive compensation for their work.

Content/Process

Student Will:

1. Gain career awareness and the opportunity to test career choice(s).
2. Receive work experience related to career interests prior to graduation.
3. Integrate classroom studies with work experience.
4. Receive exposure to facilities and equipment unavailable in a classroom setting.
5. Increase employability potential after graduation.
6. Earn funds to help finance education expenses.

Connections:

*Common Core State Standards
*KOSSA
*Common Core Technical Standards
*New Generation Science Standards
*Post-Secondary KCTCS DIT 199/299
*CTSO's – Skills USA

Internship I, II, III (Diesel)
Valid Course Codes:
470445/470446/470447

Course Description

Internship for CTE courses provide supervised work-site experience for high school students who are enrolled in a capstone course associated with their identified career pathway. Internship experiences consist of a combination of classroom instruction and field experiences. A student receiving pay for an intern experience is one who is participating in an experience that lasts a semester or longer and has an established employee-employer relationship. A non-paid internship affects those students who participate on a short-term basis (semester or less).

Content/Process

Students Will:

1. Gain career awareness and the opportunity to test career choice(s).
2. Receive work experience related to career interests prior to graduation.
3. Integrate classroom studies with work experience.
4. Receive exposure to facilities and equipment unavailable in a classroom setting.
5. Increase employability potential after graduation.

Connections:

*Common Core State Standards
*KOSSA
*Common Core Technical Standards
*New Generation Science Standards
*Post-Secondary: KCTCS DIT 198/298
*CTSO's – Skills USA

Workplace Principles
Valid Course Code:
060191

Course Description

Workplace Principles examine the changing workforce and the skills needed to adapt to constantly changing demands and expectations. The course includes, but is not limited to, problem solving, teamwork, time management, and self-management skills. Job-seeking and job-retention skills are taught through the development of resumes and job search materials. Maximum benefit is received if this course is taken in the latter part of the student's course work.

Content/Process

Students Will:

1. Describe and apply the problem-solving processes independently and in groups.
2. Describe the importance of teamwork and apply teamwork skills.
3. Identify barriers to full team participation (sexual harassment, diversity, Americans with Disabilities Act, inhibiting behaviors).
4. Apply conflict resolution skills in team situations (i.e., workplace violence).
5. Describe the importance of time and self-management in the workplace.
6. Describe personal performance skills (i.e., appropriate dress, business protocol, personality traits, customer relations skills, and professional behavior).
7. Describe the steps to take advantage of transition opportunities (i.e., lifestyle change, employment change).
8. Develop an employment portfolio including a cover letter, resume, and reference page.
9. Identify sources for job leads and employer contacts.
10. Complete application forms.
11. Prepare and practice for job interviews.
12. Practice job follow-up strategies (job acceptance and job rejection).
13. Review pre-employment tests.
14. Identify policies and procedures for a drug-free workplace, workers' compensation, Family Medical Leave Act, grievance policy, unemployment compensation, and business ethics.
15. Identify ergonomics and understand why ergonomics is important from a health point of view.
16. Demonstrate accountability of and the safe and responsible use of company resources, office equipment, machines, etc.
17. Apply Internet etiquette and safety.

18. Identify safety rules applicable to this course and demonstrate appropriate observance of said rules, including but not limited to, trip hazards, electrical cords and outlets, evacuation procedures for emergency situations (including fire, tornado, bomb threat, earthquake, etc.), lockdown procedures for emergency situations, location and contents of first aid kit, MSDS sheets, etc.

Connections:

*Common Core State Standards

*KOSSA

*Post-Secondary: KCTCS WPP 200

*CTSO's – Skills USA